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14. ABSTRACT

The UAS and JTAC can no longer be treated merely like robots and monkeys. By putting current and future USMC non-aviator JTACs on a career progression that will give them necessary training and currency, and then leveraging that experience to further their proficiency and build a link to aviation units like the VMU, the USMC can build a better CAS team. Acceptance that UAS proliferation has caused an additional need for personnel with fires experienced at the VMU and DASC, and building liaison and staff billets will finally close the loop. For the Marines, keeping our UASs ISR focused is a must. This focus also requires organic USMC assets that are available, through detachments or direct tasking, to the lowest level possible. If there is a requirement for larger unmanned assets than the tactical ones the Marines possess, the joint services should be leveraged rather than acquiring more UAS platforms. As surge demand for ISR and manned aircraft for COIN operations occurs, use of light aircraft that can fill the void, and augment UAS platforms shortcomings. The imperative for making these changes is as important to future combat success as the decisions made in employment of the rifle company.

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Robot versus Monkey: UAS and non-aviator JTAC proliferation on the battlefield and their significance to future conflicts

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Executive Summary

Title: Robot versus Monkey: UAS and non-aviator JTAC proliferation on the battlefield and their significance to future conflicts

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Thesis: As the Marines continue to engage in conflicts involving the three block war integrating air and surface fires, the proliferation UASs and JTACs will continue. This reality necessitates analyzing what we have learned about current operations in OEF/OIF, and clarifying thinking about the relationship of UASs and JTACs as it pertains to future Marine Corps operations and doctrine. Proper future integration will put trained aviators closer to the UAS controller and JTAC, providing needed guidance in JTAC skill development, career progression training capabilities, and expanding the situational awareness of unmanned units and that of the Marine Aircraft Wing to ground operations. At a minimum, organization of UAS, JTAC, and future aircraft is needed to meet the needs of American foreign policy and military strategy, and the CMC's vision for the USMC.

Discussion: Two of the most important developments to come out fighting in Iraq and Afghanistan are the proliferation of Unmanned Arial Systems (UAS) and Joint Tactical Airstrike Controllers (JTAC's), who control UASs and manned Close Air Support (CAS) aircraft despite having no flying experience. To some, the proliferation of UAS and JTAC has made combined arms integration easier, like having robots doing the hard work in the air and monkeys performing simple tasks on the ground. But the facts suggest otherwise; this new world of UAS proliferation is making combined arms more complex for both the ground controller and UAS operator. Individually these events seem to be independent of each other in their significance, but the implications of these developments are more intertwined than might be initially thought. As the Marines continue to engage in conflicts involving the three block war integrating air and surface fires, the proliferation will continue. This reality necessitates analyzing what we have learned about current operations in OEF/OIF, and clarifying our thinking about the relationship of UASs and JTACs as it pertains to future Marine Corps operations and doctrine.

Marine Corps Vision and Strategy 2025 and Marine Corps Operating concepts give a guide for where the Marines are going in the future, including ISR and C2 linked down to the squad level, and more integrated organic and joint fires that are available twenty four hours a day and in all weather. As UAS aircraft have evolved from purely ISR assets to armed aircraft, the battlefield commanders have used them increasingly. With long on-station times and the ability to loiter over a target area quietly in the relatively uncontested airspace of recent theaters of Iraq and Afghanistan, it is understandable why they have proliferated to such a degree. The doctrine for USMC UAS organization reflects the previous use of these assets for MEF-level ISR alone. The tasking and control occurs at levels that may not be optimum for the future use of these assets. The USMC has determined that an armed UAS is necessary for future conflicts. Marine Corps Operations Concepts makes the call for JTACs employed down to the lowest level, and this will require JTACs with little to no flying experience. The situation dictates better training and control on both ends of the kill chain to ensure the potential for fratricide is minimized and fires are integrated effectively. As battlefield mobility continues to increase, the need for the ground element to effectively engage targets with airborne assets increases, necessitating the

need for more JTACs located with these elements to clear those fires rapidly. ISR is in high demand, and in reality the ground commanders have seen a need for manned assets in many situations. This is reflected by current battlefield aircraft development in the USAF and USMC, and will shape the force of the future.

Conclusion: The UAS and JTAC can no longer be treated merely like robots and monkeys. By putting current and future USMC non-aviator JTACs on a career progression that will give them necessary training and currency, and then leveraging that experience to further their proficiency and build a link to aviation units like the VMU, the USMC can build a better CAS team. Acceptance that UAS proliferation has caused an additional need for personnel with fires experienced at the VMU and DASC, and building liaison and staff billets will finally close the loop. For the Marines, keeping our UASs ISR focused is a must. This focus also requires organic USMC assets that are available, through detachments or direct tasking, to the lowest level possible. If there is a requirement for larger unmanned assets than the tactical ones the Marines possess, the joint services should be leveraged rather than acquiring more UAS platforms. As surge demand for ISR and manned aircraft for COIN operations occurs, use of light aircraft that can fill the void, and augment UAS platforms shortcomings. The imperative for making these changes is as important to future combat success as the decisions made in employment of the rifle company.

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FORGOING STATEMENT.

Preface

This document is the culmination of countless hours of "shop talk" between me and my peers throughout my career. For having the patients to put up with this and still be there every day I want to thank my wife Corie.

The observations I made have been brought up to current times, but are a direct result of the experience I gained as an AV-8B pilot and forward air controller. My tours in the fleet brought about the needed combat experience to build on that experience and apply it to future Marine Corps Operations.

Without the support and great camaraderie that I received while working at the 6th Combat Training Squadron at Nellis AFB, my knowledge of the inner workings of the air Force UAS and JTAC would not have been possible. Thanks go out to the Commander, LtCol Monte Hostetler, for making me a member of his staff and giving me the ability to present ideas and bring them to fruition in a short time. Also to all the enlisted JTAC's of 6th CTS, MSgt Tom Gorski especially, I appreciate the great respect I got and the dedicated service you all showed while under my watch. It was a pleasure to serve with my entire sister service.

Finally the Air Shop at MATWS-1, with Major "Shrek" Byrum at the helm ,was a tremendous asset while developing these initial thoughts. Thanks for all the support and for making MCAS Yuma a home away from home while working at Nellis.

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INTRODUCTION

Two of the most important developments to come out of fighting in Iraq and Afghanistan over that last 10 years are the proliferation of Unmanned Aerial Systems (UAS's) and Joint Tactical Airstrike Controllers (JTAC's), who have no flying experience, controlling UAS and manned Close Air Support (CAS) aircraft. To some, the proliferation of UAS and JTAC has made combined arms integration easier, like having robots doing the hard work in the air and monkeys performing simple tasks on the ground. But the facts suggest otherwise; this new world of UAS proliferation is making combined arms more complex for both the ground controller and UAS operator. Individually these developments seem to be independent of each other in their significance, but the implications of these developments are intertwined. As the Marines continue to engage in conflicts involving the three-block war, integrating air and surface fires, the proliferation of UAS's and JTAC's will continue. This reality necessitates analyzing what we have learned about current operations in OEF/OIF, and clarifying our thinking about the relationship of UAS's and JTAC's as it pertains to future Marine Corps operations and doctrine. This cannot be overlooked, and organization and training for the modern battlefield must occur, or the possibility of poor ground and air coordination will lead to ineffective missions, decrease combat tempo, and even greater loss of life.

The call for the end of manned aircraft has been made by many of our political and military leaders, with analysts claiming that 2047 will mark the end of manned strike aircraft.[1] Recent Congressional mandates have dictated "by 2010, one-third of the aircraft in the operational deep strike force aircraft fleet are unmanned".[2] In a budget constrained environment replacing manned aircraft with unmanned aircraft may seem like an affordable option, but there is more to the cost than just the aircraft. The cost for the USMC to develop a capability that will

perform what our current and future strike and close air support (CAS) fixed-wing assets possess would be difficult to achieve. For a UAS to duplicate the capabilities of aircraft that cost in the $125 million range would be a poor fiscal decision.

The case for a manned aircraft in CAS has been accepted not only by the USMC but the JCS as well. The USAF will retain the A-10 for this purpose, as well as obtain a light attack aircraft to augment it.[3] Current command, control and tasking structures must be evaluated since the USMC future CAS force will most definitely incorporate a mix of assets.[4] The task at hand will be to ensure the UAS aircraft developed have specific missions that fit in the USMC warfighting doctrine of the two fisted war to maximize each asset brought to the battlefield.[5]

Marine Corps Vision and Strategy 2025 and Marine Corps Operating concepts suggests where the Marine Corps is going in the future, including ISR and C2 linked down to the squad level, and increasingly integrated organic and joint fires that are available twenty four hours a day and in all weather.[6] As UAS aircraft have evolved from purely ISR assets to armed aircraft, demand from the battlefield commanders has increased. With long on-station times and the ability to loiter over a target area quietly in the relatively uncontested airspace of Iraq and Afghanistan, it is understandable why UAS's have proliferated. The USMC has determined that an armed UAS is necessary for future conflicts, given the increased use of theater armed UAS to support USMC operations.[7] Despite this, USMC's current UAS organization reflects the previous use of UAS assets for ISR alone, and the tasking and control are at levels that may not be optimum for the future use of these assets.[8]

Marine Corps Operations Concepts calls for JTACs employed down to the lowest level, and this will require JTACs with little to no flying experience given the limited number of FAC's available.[9] The situation requires better training and control on both ends of the kill chain, given

the low experience level of non-aviators in CAS, to limit the potential for fratricide and integrate fires effectively. As battlefield mobility increases, the need for the ground element to effectively engage targets with airborne assets increases as they outrun the range of surface fires, and smaller units become maneuver elements. This necessitates the need for more JTAC's located with these elements to clear those fires rapidly. Traditionally the USMC only allowed aviators to perform the duty of Forward Air controller (FAC), something the USAF deviated from as far back as the 1980's. In the last 10 years the attitude of service chiefs has changed, first with more joint service doctrine driving training requirements, but more importantly with the need to deliver ISR and fires rapidly in rugged terrain and more urban areas.[10] Fighting in current conflicts has ranged from limited guerrilla warfare to full scale force on force engagements, necessitating JTAC capabilities at a lower level than in the past. With only a small pool of pilots to draw from in the short one year FAC tour, it is clear why non aviator JTAC's have been introduced.[11] Having a man on the ground that can coordinate fires rapidly in the face of an enemy that has many forms has become vital.

During low intensity conflict the UAS is inexpensive and provides a less intrusive footprint in sound and disruption. In higher threat environments the UAS has the advantage of lower human risk for ISR missions. However, as the battleflield becomes more complicated by cyber attacks and jamming of satellite frequencies required for UAS operations, the need to maintain a manned asset to compliment high threat missions still exists. UAS's are of great utility to all levels of command, and the current demand for ISR is expanding at a rate never seen in history. Analysis of US conflicts over the last 60 years indicates that limited warfare is not only likely, but will be a major part of future conflicts.[12] This reality further drives the

requirement for timely ISR on the battlefield, and has forced the ground component to work in smaller and smaller independent units.

Proper future integration will put trained aviators closer to the UAS controller and JTAC, providing needed guidance in JTAC skill development and career progression training capabilities, and expanding their situational awareness of unmanned units and that of the Marine Aircraft Wing to ground operations. At a minimum, organization of UAS, JTAC, and future aircraft is needed to meet the needs of American foreign and military policy, and the CMC vision for the USMC.[13] To understand how this can be accomplished a detailed understanding of the current DOD CAS doctrine for JTAC and UAS is necessary.

USMC UAS

USMC UAS aircraft are broken down into a three tier system which is not analogous to other military service tier systems. Tier I assets are small hand launched vehicles that have limited range and altitude capability. While useful to the small unit commander, they don't require the organization and command and control at a higher level and will be left out of this analysis.

Tier II/III assets possess capabilities that have the ability to make significant impact for the Marine Air Ground Task Force (MAGTF). They have capabilities that allow them to fly in altitude blocks with all rotary- and fixed-wing aircraft, and have ranges that put them in the larger airspace system. These systems are the core of current and proposed USMC UAS and are the primary concern of this analysis. Currently the USMC employs the RQ-7 Shadow for Tier III, and Scan Eagle as the primary Tier II UAS.

The RQ-7 has served the USMC well, seeing combat consistently in OEF and OIF theaters. Developed primarily as an ISR asset to be used at low to medium altitudes, the Shadow

fills a void between the large UAS utilized by the USAF and other ISR assets. Shadow employs both Infrared (IR) and TV camera sensors for the mission. In addition to ISR the RQ-7 is equipped with a Laser designator capable of providing terminal guidance for laser guided munitions, as well as providing corrections for surface fires.[14] Testing with air delivered 81mm guided mortars have proved this concept, and these mortars are now being put into use, giving the Shadow a strike capability.[15] The Shadow is deployable with transport vehicles specifically designed on M1152 Humvee chassis and utilize a system of trailers and a launcher, allowing the system to be deployed closer to the fight.[16] This is necessary due to the limited on station time and range. The Marine Unmanned Fixed Wing Aircraft Squadron (VMU) consists of twelve aircraft which are deployable in four aircraft detachments. Maintenance is performed primarily by the VMU Marines, with support vehicles organic to the unit.

During 2004 Marine VMU squadrons began operating the Scan Eagle ISR system in an effort to get airborne assets closer to the ground commanders.[17] VMU-1 was the first to utilize a detachment that operated the Scan Eagle to support an infantry battalion in Afghanistan. The Scan Eagle was instrumental in finding and tracking high value targets and leading and infantry squad to the location, something that was never possible before. While the detachment brought expertise from the squadron, it relied upon civilian contractors to support much of the maintenance. There is no intention to continue this program post Iraq and Afghanistan. When the contract program ends, a replacement for the scan eagle may be jointly developed by the USMC and USN.[18]

The effectiveness was proved but apparently on a limited basis. Major Byram Sullivan, Marine Aviations Weapons and Tactics Squadron 1 (MAWTS 1) Air Officer, explains; "We proved the concept of sending detachments from the VMU to support units below the MEF level.

While it was successful it was on a temporary basis, and only time will tell when and how future VMU [squadrons] will support in this way." The driving force was a need for ISR at the battalion level to bring SA to the small unit, a capability that might be lost.[19]

Currently the USMC has four VMU squadrons, three active and one reserve, operating the RQ-7. Operationally the squadrons are attached to the Marine Air Control Group (MACG), making them close to the tasking and control authority critical to ensuring Marine Air assets are tasked and routed procedurally to the correct area. This arrangement separates the VMU from other flying units, but allows the MAGTF commander the ability to have this ISR asset more readily available for his use and tasking.[20]

At the controls of the RQ-7 are Marine NCOs that have been trained to perform surveillance. In addition, the crews are aided by intelligence liaisons. There are relatively few aviators in the squadron except for the senior leadership. The future manning for Marine VMU squadrons may include a mix of combat aviators, intelligence Marines, and air controllers but at the time of this writing no clear plan is published. Those Marines piloting and maintaining the RQ-7 are selected from within the MACG community, with sergeants and corporals encompassing the bulk of those at the controls.[21]

The future of Marine UAS's is bright, with proposed Tier II/III replacements and upgrades. The RQ-7 is proposed to be replaced by 2016, and will remain the backbone of the VMU fleet. While there are several contracts being considered, the appearance is that the Insitu Integrator will be purchased to fill the requirement for Tier II UAS.[22] Both of these UAS's will have marked improvements in range and performance, with the possibility of a UAS similar to the US Army Grey Eagle capabilities. This would give the Marines a UAS with twice the range of the AV-8B Harrier II, and payload comparable to the AH-1Z. With speeds in the 120-

180KTAS range, and on station time from 6-9 hours, this would be marked improvement from the current RQ-7.[23] Getting the assets is important, but the lessons learned from Iraq and Afghanistan will point to the proper way to integrate them into the MAGTF.

JOINT UAS

Currently the USAF possesses multiple aircraft wielding the greatest UAS capability in the US arsenal. Current and future UAS's in the USAF inventory are and will be able to fly at altitudes previously only possible for the U-2 spy plane, and are able to perform nearly every mission previously assigned to manned aircraft.

The MQ-1 Predator has been the mainstay in OIF and OEF for the USAF. While initially only a ISR platform, the addition of AMG-114 Hellfire missiles began the rapid development of UAS into strike and close support aircraft. The USAF has had great success with this aircraft, and battlefield commanders from all services have come to rely on its capability to stream live video to the commander since the beginning of OEF/OIF. Primarily a theater asset, the MQ-1 was a joint use asset when available, and as the demand was raised since the beginning of OEF/OIF, so has the proliferation. With on-station times of six to nine hours with ordnance, it is easy to see the utility of the platform for ISR.[24]

The MQ-1 has been developed into a light attack ISR platform, and the U.S. Army will now incorporate it into its table of organization.[25] This is a useful capability, but the intent is for this platform to retain ISR as the primary mission.[26] Traditionally the USAF has conducted such missions, but Army commanders need the assets attached at the brigade and lower level to provide shorter response time from a platform that can operate at higher altitudes and provide longer on-station times than helicopters. The Grey Eagle[27] will be at the sole direction of a

ground commander, not an asset which must be requested from the USAF. While a break from traditional tasking, the USAF is willing to give this capability to the ground commander to allow the USAF to focus on development of larger theater assets. The MQ-1 will provide the ability to guide precision munitions from Army helicopters, as well as close support with AGM-114. The Army does not intend to replace the USAF aircraft, only compliment the missions at a lower level, leaving the USAF MQ-1 for joint and strategic tasking.[28]

The MQ-9 Reaper is the latest addition to the USAF arsenal. The Reaper provides long on station times in the 8-12 hour range, carries more ordnance than an AV-8B Harrier, and operates at the same altitudes, all at less cost than a manned aircraft.[29] This aircraft has been employed by all services on the battlefield in Iraq and Afghanistan, bringing the capability for heavy manned ISR to all services. MQ-9 missions shifted from ISR with light attack capability to deep strike and even CAS missions. Current doctrine has made it a theater level asset. The future of USAF unmanned aircraft lies in the MQ-9 and future UAS like the U.S. Navy X-47B.[30]

All USAF UAS squadrons utilize a mix of officers and enlisted crews, but in every crew there is at least one pilot with flying experience in a USAF aircraft. This is critical to the USAF system of employment, assuring that they have trained crew that understand fixed wing operations, and giving USAF crews better situational awareness to the airspace they fly their UAS in. Over time the USAF has realized that the increased capability to deliver fires from UAS has necessitated a solid link between the ground controller a UAS pilot who understands the limitations and capabilities of the system. It further gives the ground commander assurance that competent crews are able to ensure clearance of fires as well as coordinate with other aircraft when necessary.[31]

The future UAS in the USAF and USN inventory will encompass an even greater deep strike capability comparable to aircraft like the B-2 stealth bomber and F-35. The current doctrine indicates that as these aircraft are developed they will be more useful to the joint command, supporting multiple services and avoiding duplication of manned and unmanned assets.[32] As such systems develop and our services become more joint reliant, it is reasonable that these assets will be seen by Marines frequently in the years to come.[33]

USMC CONTROLLER MODEL

Using trained aviators in the role of CAS coordinator has been the standard for the USMC since World War Two. The FAC at the battalion and Air Officer at higher levels, coordinate and conduct tasking to units in the field. During the Vietnam War the tactics required more FAC capabilities due to the terrain of the jungle and hills. Aircraft such as the OV-10 were developed to perform aerial observation at slow speed, take off and land at dirt strips to coordinate with the small unit commander, and even forward air control airborne (FAC (A)). By supplementing the ground FAC, a network of CAS that is the model for our current system was developed. While the ground element always needed more controllers at times, the network was established, with airborne assets filling the missing link between the ground forces and strike aircraft. At all times there was an aviator coordinating, either on the ground or airborne. Current battlefield requirements however, are making the small unit more mobile, necessitating proliferation of non-aviators in ground controller billets that have traditionally only been filled by aviators.

Current conflicts have dispersed combat units, requiring trained controllers that can clear fires and safely coordinate airstrikes to smaller units than in previous conflicts. The development of the USMC JTAC program has been slow and somewhat misunderstood by most

of the USMC. This is not shocking given the infancy of the program; the program developed at EWTG and MAWTS-1 was published in May 2011 as the T&R Manual that includes the 8002 non-aviator MOS. Current plans employ the JTAC trained personnel from the regimental level to support battalions integrated in Forward Observer teams, and serving in both capacities. USMC manning is unclear on the future of the non-aviator JTAC organization and upkeep, and the Training and Readiness Manual (T&R) does not detail.[34] Currently the USMC T&R Manual calls for three 8002 non-aviator JTAC attached from the artillery regiment, and not a permanent staff. Three 7502 Aviator FACs per battalion are attached in a temporary billet to the battalion staff.

Currently the crops of candidates are coming from the artillery forward observer community, and with good reason. The controllers need a background in integration of fires to be safe.[35] These Marines are capable and skilled in introducing fires on the battlefield, and develop a good understanding of the combined arms fight. Despite this, most have little understanding of airspace and coordination outside of the timing and lateral separation they are used to solving when working with FACs in training and combat. The ability to ensure aircraft safety in a highly dynamic and dangerous environment of CAS is also not inherent to these controllers, but a great responsibility the FAC traditionally performs. There is a steep learning curve for non-aviators, as the JTACs have almost no opportunity to actually fly in a tactical aircraft. His understanding must be developed through experience and teaching from the FACs he is in contact with.[36] Further confusing the situation has been the training of infantry personnel as JTAC's in an effort to increase the numbers of JTAC's mandated by theater commanders.[37] It is therefore important that the ground FACs have influence on the training and upkeep of the enlisted JTAC to ensure a solid understanding of aviation and airspace is reinforced.

The T&R manual for these controllers is being developed, but given that the MOS will be a secondary skill, it can be assumed that the upkeep of these skills will only be maintained when filling a JTAC specific billet. This reality drives the level of training that can be achieved by the new controllers. With a lack of flying experience to draw from, the non-aviator JTAC is limited in his growth to the time he is exposed to trained FACs for guidance. It is of increasing importance for the Marine to develop as much experience as possible before returning to the artillery regiment and possibly losing the perishable skill of air control, and possibly returning to a JTAC billet years later.[38]

JOINT CONTROLLER MODEL

In contrast to the USMC non-aviator JTAC, the USAF counterpart is made up of nearly all enlisted airmen whose job is considered a primary skill set (AFSC in USAF, MOS for Marines). While the USAF has only had ground controllers from flying backgrounds serving with infantry units since World War Two, it has been since 1996 that the USAF began to give most ground controller jobs to these non-aviator JTAC's. Further, the current conflicts have fueled an explosion in the professionalization, organization and training for the JTAC community.

Air Support Operations Squadrons (ASOS) are manned with enlisted JTAC and pilots that conduct ground control for the Army. Since 2009 the USAF has instituted professional Air Officers as well as rated pilots on two year tours at an ASOS to serve as liaisons with the Army staff and the JTAC controllers detached to the Army. It is important to understand that these controllers and officers, although tasked to support the Army, are not permanent members of the infantry staff.[39] This is in stark contrast to the way Marine FAC's are a permanent members of battalion staffs and work directly for the commanders. The addition of career air officers is a

decision the USAF made to try and bring continuity to the JTAC career field, since their leadership was previously only pilots on short tours and who were not terminal controllers. Each Infantry Combat Brigade rates six JTAC's and one Air Officer sourced from the ASOS. It is important to note that these controllers do not conduct helicopter operations or provide forward observation for surface fires, despite being trained to utilize these assets.[40] Currently the USAF is in the process of increasing training of JTAC's to be able to source a deployed brigade with one JTAC in each squad to the new Army demands.

The U.S. Air Force and U.S. Army theater air control system/Army air-ground system (TACS/AAGS) is vastly different than the USMC Marine air command and control system (MACCS). Tasking and control for CAS missions is coordinated through the ASOC, the TACS equivalent of the DASC. The ASOC requires positive aircraft control through several systems of radar, aircraft transponder returns and a control center that communicate clearance of fires to eliminate the need for an air officer at the battalion level. [41] This is due to the inherent lack of trained aviators in the battalion staff to coordinate like a USMC FAC, as well as lack of trust between the services. This system attempts to reduce the airspace burden on the JTAC, and the intent is to alleviate the need for clearance of fires outside the local level. To coordinate, the ASOC has a mix of aviators and JTACs that put aircraft in the right place and time to meet requests and clear fires at the division level. While this is changing with the USAF trying to develop and train more ASOC controllers and put more units into the field to make the system more responsive and clear fires at the brigade level, that has been slow to develop.[42] The USAF system maximizes experienced controllers in the tasking by utilizing JTACs who serve on the ASOC staff, directing and clearing fires.

Maintaining currency and proficiency in the USAF JTAC community has the same challenges as in the USMC, but there is no requirement to have this airman do other missions such as artillery fires and control of helicopters, as these are the inherent missions of the Army personnel he serves. The recent commitment by the USAF to the JTAC program has seen a large increase in CAS flights dedicated to proficiency and training of the non aviator JTAC community. The emphasis on proficiency and coordination is not mere lip service; the USAF has been taking great strides to update the JTAC training, incorporating UAS employment into their initial, sustainment, and deployment training.[43]

THE FUTURE OF THE ROBOT AND MONKEY

The background and introduction to the current state of UAS and JTACs make clear the increasing complexity for both. Rather than merely dealing with robots and monkeys, servicemen that require high levels of proficiency and training to be utilized effectively. The experience of joint forces serves to help the USMC avoid repeating mistakes, as well as understanding how to utilize these assets more effectively. Experience also shows the continued need for manned ISR platforms.

Increasing the number of non-aviator JTAC's may degrade the capabilities resident with aviator FACs. With the JTAC's limited understanding of airspace and aircraft in general, much of the resident knowledge provided to the ground commander by FACs is lost. The lack of understanding of time and space is even more important, as JTAC's are called on to incorporate UAS's into the airspace inhabited by slow moving helicopters and fast moving jets. Having a real time video image of the battlefield can be a huge asset, but transitioning to armed engagement requires increased situational awareness to avoid fratricide. This situational awareness is significantly enhanced by experience, something that is difficult for non aviators to

acquire in a short time.[44] When the battlefield becomes heavily saturated with aircraft and the fighting on the ground is intense, the JTAC must have even more situational awareness, increasing the danger of inadequate support and even of fratricide when ground combat units need that support most.[45]

With the proliferation of UAS's, and more importantly armed UAS's, having a competent and trained controller is not just desired, but necessary. While the development of JTAC's may seem to be thought out, the change appears to be more of a band-aid fix rather than a deliberately planned program. For instance, the USMC hasn't had a plan for the future training and maintenance of the non-aviator JTAC over the five years that have passed since the USMC has begun using them. In 2010 the USAF initial training program had to go from producing 80 JTAC per year to 300 virtually overnight due to the Army commander's request.[46] The USAF had no real plan to provide leadership and organization to the JTAC community, or follow-on training for these controllers, for nearly a year. This experience parallels that of previous conflicts, in that it is difficult to reorganize while fighting a war. In Vietnam and afterwards it took decades to apply lessons learned and adapt such things as new weapons and organization of forces.[47]

The demands of warfare in the future will make it imperative that the USMC UAS operator be able to communicate with other aircraft and relay their position and intentions to the rest of the force support team. The coordination from the battalion air officer can help with this, but in doctrine while operating in CAS missions utilizing uncontrolled airspace, it is the pilot who is responsible for safe separation.[48] Will this still be the case for the UAS that is operated by a Sgt? During large scale conflicts such as the initial invasion of Iraq and Operation Phantom Fury (The November 2004 Fallujah Campaign), the USMC UAS were small in numbers and

tasked directly from the MAW. Despite this there were numerous occasions of UAS becoming conflicts with USMC FW assets, Major Green was a FAC during Phantom Fury and explains; "The UAV was poorly coordinated at the RCT or Battalion level. None of the FAC's or AirO's at 3/1 had any idea when or where these things were going to be, and we had no SA to the frequencies they might be using. They wouldn't check-in when in our airspace, and we had no way to utilize them. Those guys just didn't think like a pilot, or bother to coordinate with the AirO."[49] Had these UAS been attached at the RCT level they would have been more effective.

The USAF solution to similar problems has been to ensure there is a trained pilot either at the controls or in direct supervision of all UAS missions.[50] This is a luxury of manpower the USMC does not possess. For the Marines, the need for ground controllers that understand airspace coordination is evident, given the proliferation of UAS on the battlefield, and their availability to lower and lower levels of command. With the VMU currently located at the MACG vice a tactical Marine Aircraft Group, it will be imperative that aviators and Marines with a fires backgrounds like JTAC's be incorporated into the squadrons to provide guidance in requesting, coordinating, and employing armed aircraft. Such incorporation would lead to a better skill-enhancing career experience for the JTAC and would improve the employment and safety of the VMU.

JTAC SOLUTIONS

The requirement to maintain JTAC controllers past current conflicts is clear. As Joint UASs proliferate, the non-aviator JTAC will have more requests to coordinate and integrate the ISR and light attack capability of unmanned aircraft into the ground scheme of maneuver. The UAS aircraft will put an even greater burden on the JTAC to have solid airspace control and situational awareness as a vital prerequisite for safety. This is not to say that the air officer at the

battalion has lost control, but as units become increasingly dispersed fighting modern conflicts, the non-aviator JTAC is increasingly finding himself in a position needing to coordinate without a FAC in the loop.[51] Given the use of uncontrolled airspace by the USMC for flexibility on the battlefield, the onus is on the controller to have greater SA than JTACs in his sister services.

Marine Officer FACs have the advantage of training not only in aviation operations and conduct, but infantry operations and fires integration. This is not the case for the non aviator JTAC. For instance the enlisted artillery FO that trains as a JTAC has an understanding of ground ops as well as integration of fires, but the only knowledge of aviation he has is his four weeks at Expeditionary Warfare Training Group (EWTG) for training, and the mentorship of FACs when he serves in the JTAC capacity. To remedy this JTAC career progression should include exposure to flying units and aviation operations so that he can increase his SA and become more useful at the battalion and regimental level as a controller in the Fire Support Coordination Center (FSCC) and in the field. Once trained the JTAC at the artillery regiment should stay in a JTAC billet as long as possible. If the JTAC works up and deploys with a unit, when he returns he should be afforded an opportunity to go work with the Marine Aircraft Wing (MAW). As a liaison or even working on the staff of VMU squadrons and in the DASC, the JTAC offers expertise to these units, but also expand his understanding of aviation operations.

First by putting a JTAC at the VMU we will increase the knowledge of ground operations resident in the squadron, which is important as munitions employment becomes more common. The JTAC will build into the unit a better and safer UAS controller. This, in addition to staffing officers from TACAIR backgrounds, can provide the VMU with a healthy mix of Marines with fires skills cycling in and out of the unit. This will further expand the JTACs understanding of airspace and situational awareness to aviation operations, making him more effective when he

serves as a JTAC for ground combat units. At the DASC the JTAC will understand the tasking and direction of assets that pilots learn prior to entering a FAC tour. Following this the JTAC may return to the artillery regiment, but should be sent to a billet dedicated to 8002 designations, where senior JTACs can fill instructor and evaluator billets.

As JTACs proliferate, the requirement for proficiency controls, training "runs" required to maintain qualifications, is going to rise. The current requirement of six controls per JTAC every six months alone, combined with increasing numbers of JTACs, would cause the requests for CAS training sorties to rise rapidly.[52] This is, in the shadow of reduced flying budgets, aircraft that need heavy maintenance from years of war use, and decreased flight hours available from aircraft serving beyond their planned service lives, will compound a severely limit availability of aircraft as training tools. The high impact on USMC TACAIR will further drive units to seek support from sister services to fill the voids, and undermine the autonomy of USMC CAS aviation. In addition, if it is the desire of the USMC to keep these JTACs current no matter whether they are assigned to JTAC billets in deploying units or not, the number of CAS sorties will increase even further. This burden cannot be ignored, as the skill to be a capable controller has been proven to be highly perishable, especially with non-aviator JTACs. It is for this reason the USAF has gone to career JTAC designations and ensures that during the first six to eight years of service the JTACs maintain currency while progressing in the career field.[53] This is a model the Marine Corps should adopt.

UAS SOLUTIONS

The current VMU organization was developed to reflect the use of RQ-7 and Tier III assets at the MEF. While this might have been coherent in the past, given the small number of organic assets, the increase in UAS requests does not fit current USMC VMU squadron

organization. The need to send detachments was proven recently in Iraq and Afghanistan, and serves as a model for VMU deployment in the future.[54]

As the VMU aircraft become more capable, the need to have controllers with a fires background is evident. With not only precision weapons capability, but the ability to support munitions from other TACAIR aircraft, the UAS driver requires further training than just being able to perform ISR. By ensuring JTAC and aviators from TACAIR are attached to the VMU, this can be achieved.

The VMU should be expanded in its size and scope to be able to directly support battalions and regimentals, and not be organized solely as a MEF asset. The parent squadron should be able to support smaller ground units with detachments, while maintaining the size needed for higher-level operations with the main squadron. This would free fixed-wing and rotary-wing assets to pursue missions that are better suited to their role than merely ISR. UASs that directly support units are more efficient and gain a better understand of their SOM; in the end this can save lives.[55] The Scan Eagle detachment was an attempt to do just that, and gave the battalion the ability to maximize the asset's effectiveness, while being able to ensure it has these assets available. The point is that assets should be close to the units they support to reduce the response time and increase time on station. Given that the speed of RQ-7 rarely exceeds 100 kts, basing close to the supporting unit is important. This applies to training and combat deployments equally. With TACAIR aviators as detachment Officers in Charge, and JTAC as fires advisors, the VMU can accomplish this goal.

VMUs should not get too invested into attack missions; carrying weapons limits TOS and range, and causes a problem with mission creep. This is what happened with the MQ-1 in the

USAF. The asset began to take on a strike roll, and eventually the MQ-9 had to be developed to allow MQ-1 operators to focus more on the primary role as ISR.

As we utilize VMU efficiently, manned aircraft can support higher level missions in maneuver. This in turn can allow manned aircraft squadrons to fly more surge sorties at critical times, which better supports maneuver warfare. One example occurred when the town of Al Amara was bypassed by ground forces during OIF, and fixed-wing and rotary-wing as well as ISR assets securing the flank for RCT-5 during its maneuver to Al Kut.[56] Likewise, by having UAS to perform ISR, surge operations by manned aircraft during Fallujah could be dedicated to CAS where they were needed by ground forces.[57] More UASs is not what the Marines need, but rather the right type to fill the ISR and light attack void. The VMU should avoid being developed into another strike or CAS platform and retain the current requirements as a primarily ISR platform that can provide light attack as a secondary capability.

Marines are expected to come from the sea, and as the current conflicts wind down, this requirement will only increase. Given the limitations of logistics this imposes, the ability to utilize assets such as MQ-9 and larger future Joint UAS may not be realistic for the maneuver element. The joint forces have assets that can augment Marine UAS requirements, and the US Navy development of a theatre-level UAS reflects this. As Marines are deployed in current and future conflicts, the use of theatre UAS assets by the MEF and MAW for ISR and deep strike, will allow the tactical level UASs to directly support the lowest level possible.

ADDRESSING THE SURGE DEMAND FOR ISR

Proliferation of UAS and JTAC may also have shown us that a dedicated manned ISR/light attack platform is necessary to augment these two critical missions.[58] Current conflicts have commanders at all levels demanding dedicated ISR, and this is driven by the nature of not

only the enemy, but also the increasingly urbanized terrain. COIN and IW missions are not ongoing, and demand for ISR assets go in surges. Utilizing manned assets may be the answer to this requirement, and address limitations that UAS have brought to light in the most current conflicts. Utilizing existing manned aircraft to augment the need for ISR on demand may be a better solution than just higher proliferation of UASs.

UAS proliferation has brought about many challenges identifying friendly from enemy and broadened the discussion about how important manned aircraft are in the future. It is for this reason that the argument has been made to keep aviators in the cockpit for ISR and CAS. The USAF has found that beyond the current wars the need for manned ISR is increasing. This requirement is due to the inability to have unmanned aircraft flexible enough to surge during large maneuvers, rapidly deploy from long distances, and the inability to clear fires from the air while sitting in a booth at Creech AFB, NV. Development of a light attack / ISR aircraft for COIN operations, such as the MC-12 Project Liberty and AT-6, will augment UAS where a manned asset is desired, and is less costly than utilizing TACAIR assets for these missions. In turn, the longer on-station times of these assets build continuity for the ground commander and save money in cost of operations compared to tactical jets and helicopters.[59]

Airspace filled with aircraft of varying airspeeds and capabilities requires a FAC (A) coordinating for the battalion or a tactical air controller airborne (TAC (A)) to control coordinate for the direct air support center (DASC).[60] A light manned platform might be the missing link that the USMC needs to successfully bring the UAS and JTAC to their full potential and fulfill the CMC visions 2025 and USMC Operating Concepts 2010.[61] With an ability to take off and land at austere sites, fly higher and faster than helicopters, coordinate UAS operations and provide manned ISR and timely attack far more efficiently that current strike aircraft (F/A-18,

and AV-8B primarily), this platform would meet the demands of the two-fisted war.[62] The USMC has addressed this battlefield requirement with the development of the Harvest Hawk KC-130J into an ISR and light attack platform for use in Afghanistan.[63] While it may have been successful, the cost effectiveness of using a C-130-sized aircraft versus something smaller like the MC-12 or AT-6 is obvious. In the case of the MC-12, it is an airframe that the USMC already possesses and utilizes for utility operations, making conversion a much more affordable and efficient platform.

CONSLUSION

The UAS and JTAC can no longer be treated merely like robots and monkeys. By putting current and future USMC non-aviator JTACs on a career progression that will give them necessary training and currency, and then leveraging that experience to further their proficiency and build a link to aviation units like the VMU, the USMC can build a better CAS team. Acceptance that UAS proliferation has caused an additional need for personnel with fires experienced at the VMU and DASC, and building liaison and staff billets will finally close the loop. For the Marines, keeping our UASs ISR focused is a must. This focus also requires organic USMC assets that are available, through detachments or direct tasking, to the lowest level possible. If there is a requirement for larger unmanned assets than the tactical ones the Marines possess, the joint services should be leveraged rather than acquiring more UAS platforms. As surge demand for ISR and manned aircraft for COIN operations occurs, use of light aircraft that can fill the void, and augment UAS platforms shortcomings. The imperative for making these changes is as important to future combat success as the decisions made in employment of the rifle company.

Appendix A - AAI Industries, http://www.aaicorp.com/pdfs/Shadow%20200.pdf .

RQ-7 Shadow

General characteristics

- **Length:** 11.2 ft (3.4 m)
- **Wingspan:** 14 ft (4.3 m)
- **Height:** 3.3 ft (1.0 m)
- **Empty weight:** 186 lb (84 kg)
- **Gross weight:** 375 lb (170 kg)
- **Powerplant:** 1 × Wankel UAV Engine 741 used only with Silkolene Synthetic Oil , 38 hp (28 kW)

Performance

- **Maximum speed:** 135 mph; 118 kn (218 km/h)
- **Cruising speed:** 103 mph; 90 kn (166 km/h)
- **Range:** 68 mi (59 nmi; 109 km)
- **Endurance:** 6 h
- **Service ceiling:** 15,000 ft (4,572 m) ELOS (Electronic Line Of Sight)

Note: When outfitted with IE (Increased Endurance) Wings, the CRP (Communications Relay Package) and the 1102 engine, the specifications change dramatically. Under the new configuration, endurance time is increased to 8.5 hours, wing span is increased to approx. 22 feet (6.7 m), and the service ceiling is 18,000 ft (only with authorization).

Appendix B - Air Force Special Operations Command, Public Affairs Office, 229 Cody Ave., Suite 103; Hurlburt Field, FL 32544-5312; DSN 579-5515 or 850-884-5515; e-mail: afsoc.pa@hurlburt.af.mil

Scan Eagle

Specifications:
First flight: April 2002
Type: Autonomous unmanned reconnaissance vehicle
Length: 4 feet
Wingspan: 10 feet
Altitude: 16,000 feet and low altitudes
Speed: Approx 75mph maximum
Endurance: 16 to 48 hours
Payload: Electro-optical or infrared camera

Appendix C- Air Combat Command, Public Affairs Office; 130 Andrews St., Suite 202; Langley AFB, VA 23665-1987; DSN 574-5007 or 757-764-5007; e-mail: accpa.operations@langley.af.mil

MQ-9 Reaper

General Characteristics
Primary Function: Remotely piloted hunter/killer weapon system
Contractor: General Atomics Aeronautical Systems, Inc.
Power Plant: Honeywell TPE331-10GD turboprop engine
Thrust: 900 shaft horsepower maximum
Wingspan: 66 feet (20.1 meters)
Length: 36 feet (11 meters)
Height: 12.5 feet (3.8 meters)
Weight: 4,900 pounds (2,223 kilograms) empty
Maximum takeoff weight: 10,500 pounds (4,760 kilograms)
Fuel Capacity: 4,000 pounds (602 gallons)
Payload: 3,750 pounds (1,701 kilograms)
Speed: Cruise speed around 230 miles per hour (200 knots)
Range: 1,150 miles (1,000 nautical miles)
Ceiling: Up to 50,000 feet (15,240 meters)
Armament: Combination of AGM-114 Hellfire missiles, GBU-12 Paveway II and GBU-38 Joint Direct Attack Munitions
Crew (remote): Two (pilot and sensor operator)
Unit Cost: $53.5 million (includes four aircraft with sensors) (fiscal 2006 dollars)
Initial operating capability: October 2007

Appendix D – Air Combat Command, Public Affairs Office; 130 Andrews St., Suite 202; Langley AFB, VA 23665-1987; DSN 574-5007 or 757-764-5007; e-mail: accpa.operations@langley.af.mil

MQ-1B PREDATOR

General Characteristics
Primary Function: Armed reconnaissance, airborne surveillance and target acquisition
Contractor: General Atomics Aeronautical Systems Inc.
Power Plant: Rotax 914F four cylinder engine
Thrust: 115 horsepower
Wingspan: 55 feet (16.8 meters)
Length: 27 feet (8.22 meters)
Height: 6.9 feet (2.1 meters)
Weight: 1,130 pounds (512 kilograms) empty
Maximum takeoff weight: 2,250 pounds (1,020 kilograms)
Fuel Capacity: 665 pounds (100 gallons)
Payload: 450 pounds (204 kilograms)
Speed: Cruise speed around 84 mph (70 knots), up to 135 mph
Range: Up to 770 miles (675 nautical miles)
Ceiling: Up to 25,000 feet (7,620 meters)
Armament: Two laser-guided AGM-114 Hellfire missiles
Crew (remote): Two (pilot and sensor operator)
Initial operational capability: March 2005
Unit Cost: $20 million (fiscal 2009 dollars) (includes four aircraft, a ground control station and a Predator Primary Satellite Link)

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